# CONTROL INTERFACE CARD ADAPTED FOR AUTO-RELOADING OBJECT POSITION DATA, COMPARING OBJECT POSITION DATA, AND PROVIDING A TRIGGERING SIGNAL

## BACKGROUND OF THE INVENTION

The present invention relates to a control interface card adapted for use with the CPU of a host computer and, more particularly to a control interface card adapted for auto-reloading object position data, comparing registered object position data with feedback object position data, and providing a triggering signal to the CPU of the host computer when a comparison matched.

When an industrial computer proceeding with a continuous motion position comparison (for example, fixed-position photographing), the CPU (central processing unit) of the computer is controlled to set one object position data into a position compare circuit for comparison with a feedback position data. When the comparison matched, the position compare circuit gives a signal to the CPU, causing the CPU to provide a next object position data for comparison. This action is repeated again and again. Further, this action can be applied to a counter or the like. However, the CPU may simultaneously proceed with various system handling and computing tasks during the operation of the industrial computer. When reloading new object position data, the CPU will spend extra

computing time. This extra task may affect the operation of the CPU in proceeding with other system handling and computing tasks. Furthermore, due to software and operation system design differences, it is difficult to estimate the whole object position data reloading time.

## SUMMARY OF THE INVENTION

The present invention has been accomplished to provide a control interface card, which eliminates the aforesaid drawbacks. It is therefore the main object of the present invention to provide a control interface card, which has a data buffer for registration of object position data so that the position compare circuit can directly fetch registered object position data for comparison with feedback position data without through the CPU of the host computer.

According to the present invention, the control interface card (for example, PCI-8164) comprises a bus controller connected to the CPU of a host computer, a data buffer adapted for registration of object position data computed by the CPU of the host computer, a position compare circuit adapted for fetching registered object position data from the data buffer and comparing the fetched object position data with feedback position data obtained from an object shifting control means, and then fetching a next registered object position data from the data buffer for a next

comparison after matching of one comparison, a trigger I/O circuit adapted for providing a triggering signal to the CPU of the host computer upon matching of one comparison at the position compare circuit, and a bus arbitrator connected to the bus controller and adapted for providing an interrupt signal to the CPU of the host computer through the bus controller upon matching of one comparison at the position compare circuit.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing showing the system architecture of the present invention.

FIG. 2 is a system block diagram showing the architecture of the present invention.

FIG. 3 is a flow chart explaining the action of the CPU to store object position data in the data buffer according to the present invention.

FIG. 4 is a flow chart explaining the functioning of the position compare circuit according to the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, a control interface card **1** (for example PCI-8164 motion control card) is shown comprising a data buffer **11**, bus arbitrator **13**, a position compare circuit **15**, a trigger I/O circuit **16**, and a bus controller **17**. The data buffer **11** is adapted for registration of object position data computed by the

CPU (central processing unit) of the host computer (not shown). The position compare circuit **15** is adapted for comparing feedback position data with the object position data fetched from the data buffer **11**. When matched after the comparison of the feedback position data with the fetched object position data, the position compare circuit **15** fetches another object position data from the data buffer **11** for another comparison. The bus controller **17** of the control interface card **1** is connected to the bus **2** of the host computer for intercommunication between the CPU of the host computer and the control interface card **1**. The position compare circuit **15** proceeds with the following actions after the comparison of the feedback position data with one object position data fetched from the data buffer **11**:

(1) sending a triggering signal to the trigger I/O circuit **16**;

(2) sending an interrupt signal to the host computer to prompt the user; and

(3) fetching a next object position data from the data buffer **11**.

Further, the CPU of the host computer stores computed object position data in the data buffer **11** via the bus **2**, the bus controller **17**, and the bus arbitrator **13**. The trigger I/O circuit **16** converts the triggering signal from the position compare circuit **15** into a pulse signal of fixed bandwidth for output to the outside of the control interface card **1**. The bus arbitrator **13** controls the

circulation of data among the bus controller **17**, the data buffer **11**, and the position compare circuit **15**, and protects the circulated data.

Referring to FIG. 1 again, the position feedback data can be obtained from the optical scale **5** or the motor driver **4**.When started the motor **3** to rotate the screw rod **31**, the object is shifted leftwards or rightwards, and the position of the object is measured by the optical scale **5** or the motor driver **4** and fed back to the position compare circuit **15** for comparison with the object position data fetched from the data buffer **11**. When matched, the trigger I/O circuit **16** outputs a triggering signal (a pulse signal of a fixed bandwidth) to the external device to which the control interface card **1** is connected.

FG. 2 is a block diagram showing the architecture of the present invention. FIG. 3 is a flow chart explaining the action of the CPU to store object position data in the data buffer. The procedure of storing object position data in the buffer includes the steps of:

(101) driving the CPU to compute all object position data to be compared;

(102) checking if the segment from the bus arbitrator **13** to the position compare circuit **15** is in use or not (when in use, it means that the position compare circuit **15** is fetching a

new object position data from the data buffer)?, and then repeating step (102) if positive, or proceeding to the next step if negative;

(103) setting the right of using the segment from the bus arbitrator **13** to the data buffer **11** to be belong to the CPU;

(104) judging if the setting succeeded or not? and then proceeding to the next step if positive, or returning to step (102) if negative;

(105) transmitting all object position data through the bus **2**, the bus controller **17**, and the bus arbitrator **13** to the data buffer **11**, enabling the object position data to be registered in the data buffer **11**; and

(106) relieving the power of using the segment from the bus arbitrator **13** to the data buffer **11**, and then ending the procedure.

Referring to FIG. 4 and FIGS. 1 and 2 again, after registration of object position data in the data buffer **11** by the CPU, the position compare circuit **15** runs the following steps:

(201) fetching the first object position data from the data buffer **11**;

(202) rotating the motor **3** to shift the object, and feeding back the data of the position of the object to the position compare circuit **15** for comparison during shifting;

(203) driving the position compare circuit **15** to compare the feedback data of the position of the object **33** obtained from the optical scale **5** or the motor driver **4** with the object position data fetched from the data buffer **11**, and then proceeding to the next step if the data matched, or repeating step (203) if the data not matched;

(204) sending a triggering signal to the trigger I/O circuit **16**, and providing an interrupt signal to the host computer;

(205) judging if the object position data registered in the data buffer **11** have all been fetched and compared, and then ending the procedure is positive, or proceeding to the next step if negative; and

(206) fetching the next object position data from the data buffer and then proceeding to step (203).

By means of the functioning of the control interface card **1**, the CPU achieves high speed and accurate position comparing and triggering operation.

The aforesaid control interface card **1** can be a motion control interface card, or an industrial counting interface card. Further, the bus controller **17** and the bus **2** can be of PCI-BUS, ISA, Compact PCI, PC-104, or any suitable interface means capable of making communication with the related peripheral devices.

A prototype of object position data auto-reloading,

comparing, triggering system has been constructed with the features of the annexed drawings of FIGS. 1~4. The object position data auto-reloading, comparing, triggering system functions smoothly to provide all of the features discussed earlier.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.